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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/052,234	01/16/2002	Duc Chau	40013.003	9589

27966 7590 07/23/2003

KENNETH E. HORTON
KIRTON & MCCONKLE
60 EAST SOUTH TEMPLE
SUITE 1800
SALT LAKE CITY, UT 84111

EXAMINER

GARCIA, JOANNIE A

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 07/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/052,234

Applicant(s)

CHAU ET AL.

Examiner

Joannie A Garcia

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 18-20 and 25-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 21-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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The election filed 06-09-03 is acknowledged. Claims 18-20, and 25-27, were inadvertently included in Group I in the Office Action mailed 05-02-03, but should have been included in Group II, which includes claims drawn to device.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 117 and 122 in Figure 1. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "4A" has been used to designate both isolation dielectric and etched isolation dielectric, in Figures 3 and 4, respectively. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "23" has been used to designate both patterned photoresist layer and oxide layer, in Figures 5 and 6, respectively. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "32" and "35" have both been used to designate implant region in Figures 12 and 13, respectively. A proposed drawing correction or corrected drawings are required in reply

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to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claims 7 and 23, are objected to because of the following informalities: In claims 7 and 23, line 3, "have a" before "etching rate" should be replaced with --having an--. Appropriate correction is required.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 1-17, and 21-24, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 6, recite the limitation "bottom and sidewall of the trench" in line 3. There is insufficient antecedent basis for this limitation in the claims.

Claims 1 and 6, recite the limitation "bottom and sidewall of the oxide layer" in line 4. There is insufficient antecedent basis for this limitation in the claims.

In claims 2, 3, 7, 15 16, and 23, line 1, --self-aligned-- should precede "isolation cap".

Claim 4 recites the limitation "upper surface of the second dielectric" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

The term "substantially" in claims 4 and 8, is a relative term, which render the claims indefinite. The term "substantially" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would

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not be reasonably apprised of the scope of the invention. If applicant intends a particular surface for the second dielectric layer, it should be clearly recited.

Claims 12 and 24, recite the limitation "portion of the substrate not containing the nitride-containing layer" in lines 4-5, and 5-6, respectively. There is insufficient antecedent basis for this limitation in the claim.

Claims 12, 21, 22, and 24, recite the limitation "bottom and sidewall of the trench" in lines 6, 4, 4, and 7, respectively. There is insufficient antecedent basis for this limitation in the claims.

Claim 12 recites the limitation "bottom and sidewall of the oxide layer" in line 7. There is insufficient antecedent basis for this limitation in the claims.

Claim 15 recites the limitation "polysilicon layer" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claims 21, and 22, recite the limitation "bottom and sidewall of the gate oxide" in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim 24 recites the limitation "trench" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 24 recites the limitation "bottom and sidewall of the gate oxide" in line 8. There is insufficient antecedent basis for this limitation in the claim.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 6, 12, and 16, are rejected under 35 U.S.C. 102(e) as being anticipated by

Divakaruni et al (2002/014907 A1).

Divakaruni et al discloses providing a substrate 10 with an upper surface (Figure 1A), providing a nitride-containing layer 14 on a portion of the substrate upper surface (Figure 1A), providing a trench 16 in the substrate in a portion of the substrate not containing the nitride-containing layer (Figure 1B), providing an oxide layer 18 on a bottom and sidewall of the trench (Figure 1C, and Paragraph 0007, lines 1-3), providing a conductive layer 22 on a bottom and sidewall of the oxide layer (Figure 1D), the conductive layer having an upper surface below the upper surface of the substrate (Figure 1D), providing by selective deposition a self-aligned isolation cap 50/28 on the conductive layer within the trench by using a combination of dielectric materials with different etching rates (Figure 2(d) and 4, and Paragraphs 0037 and 0038), and removing the nitride-containing layer (Figure 2(g)).

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 12, 14, 15, 17, 21, and 24, are rejected under 35 U.S.C. 102(b) as being anticipated by Baliga (U.S. Patent 5,998,833).

Baliga discloses providing a substrate 10 with an upper surface 15a (Figure 4A), providing a nitride-containing layer 22b on a portion of the substrate upper surface (Figure 4C), providing source and channel regions 16/18 proximate a trench formed in the substrate in a portion of the substrate not containing the nitride-containing layer (Figure 4F), providing a gate oxide layer 28 on a bottom and sidewall of the trench (Figure 4G), providing a polysilicon conductive gate 30 on a bottom and sidewall of the gate oxide (Figure 4H, and Column 10, lines 9-12), the polysilicon conductive gate having an upper surface below the upper surface of the substrate (Figure 4H), providing a silicon oxide self-aligned isolation cap 32 on the polysilicon conductive gate within the trench (Figure 4I, and Column 10, lines 5-7), wherein the silicon oxide self-aligned isolation cap is formed by oxidizing the upper surface polysilicon conductive gate (Column 10, lines 18-21), and removing the nitride-containing layer (Figure 4J, and Column 10, lines 21-24).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baliga as applied to claims 1, 2, 5, 12, 14, 15, 17, 21, and 24 above, and further in view of the following comments.

Baliga discloses providing a polysilicon conductive gate 30 on a bottom and sidewall of the gate oxide, the polysilicon conductive gate having an upper surface below the upper surface of the substrate (Figure 4H). Baliga does not disclose that the distance between the upper surface of the polysilicon conductive gate and the substrate upper surface is 0.5 microns. It would have been a matter of routine optimization within the teachings of Baliga to determine a suitable distance to achieve the polysilicon conductive gate formation step.

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baliga (U.S. Patent 5,998,833), in combination with Divakaruni et al (2002/0149047 A1).

Baliga discloses providing a substrate 10 with an upper surface 15a (Figure 4A), the substrate having a trench therein (Figure 4F), providing source and channel regions 16/18 proximate the trench (Figure 4F), providing a gate oxide layer 28 on a bottom and sidewall of the trench (Figure 4G), providing a conductive gate 30 on a bottom and sidewall of the gate oxide (Figure 4H, and Column 10, lines 9-12), the conductive gate having an upper surface below the upper surface of the substrate (Figure 4H), and providing a self-aligned isolation cap 32 on the conductive gate within the trench (Figure 4I, and Column 10, lines 5-7).

Baliga does not teach that the self-aligned isolation cap is a combination of dielectric materials with different etching rates. Divakaruni et al discloses providing a substrate 10 with an upper surface (Figure 1A), the substrate having a trench 16 therein (Figure 1B), providing a gate oxide layer 18 on a bottom and sidewall of the trench (Figure 1C, and Paragraph 0007, lines 1-3), providing a conductive gate 22 on a bottom and sidewall of the gate oxide (Figure 1D), the conductive gate having an upper surface below the upper surface of the substrate (Figure 1D), and providing a self-aligned isolation cap 50/28 on the conductive gate within the trench by using a combination of dielectric materials with different etching rates (Figure 2(d) and 4, and

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Paragraphs 0037 and 0038). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Baliga and Divakaruni et al to enable the step of forming the self-aligned isolation cap 32 of Baliga to be performed.


Claims 3, 4, 7-11, and 23 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956. **See MPEP 203.08.**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner J. Garcia whose telephone number is (703) 306-5733. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax number for this group is (703) 308-7722 (and 7724), and (703) 305-3431 (and 3432). MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.


JAG
7/11/03


George Fourson
Primary Examiner